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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

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Technical Report on Development of USES Aptitude Test Battery

For .....

Maintenance Man, Building (any ind.) 5-83.611

B-630 S-350

U. S. Employment Service
in Cooperation with
Pennsylvania State Employment Service

September 1965

GATB Study #2566

DEVELOPMENT OF USES APTITUDE TEST BATTERY

For

Maintenance Man, Building (any ind.) 5-83.611

B-630

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Maintenance Man, Building (any ind.) 5-83.611. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB, B-1002 Scores
G-General Learning Ability	70
V-Verbal Ability	70
N-Numerical Aptitude	75

RESEARCH SUMMARY

Sample:

66 male applicants for training in Manpower Development and Training (MDTA) courses at vocational high schools in Chester, Phoenixville and Pittsburg, Pennsylvania

Criterion:

Instructors' ratings

Design:

Longitudinal (tests were administered before training and criterion data were collected at the end of training)

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude - criterion corelations and selective efficiencies.

Predictive Validity: Phi Coefficient = .32 ($P/2 < .005$)

Effectiveness of Norms: Only 69% of the non-test-selected trainees used for this study were good trainees; if the trainees had been test-selected with the above norms, 77% would have been good trainees. 31% of the non-test-selected trainees used for this study were poor trainees; if the trainees had been test-selected with the above norms, only 23% would have been poor trainees. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Trainees	69%	77%
Poor Trainees	31%	23%

SAMPLE DESCRIPTION

Size: N = 86

Occupational Status: Applicants

Work Setting: Applicants were enrolled at the following vocational high schools:

1. Chester Vocational High School, Chester, Pennsylvania
2. Phoenixville Area High School, Phoenixville, Pennsylvania
3. Connelly Vocational High School, Pittsburgh, Pennsylvania

School Selection Requirements:

Education: Applicants were required to be able to read, write and do simple arithmetic problems, including fractions and decimals (determined by an interview).
Previous experience: None
Tests: None
Other: Interview

Principal Activities: The job duties for which the sample was being trained are those shown in the job description in the appendix.

Minimum Experience: All members of the sample were applicants.

TABLE 2

Means, Sigmas, Ranges and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education and Experience

	Mean	Sigma	Range	r
Age (years)	41.9	9.6	19-59	.074
Education (years)	9.8	1.6	6-12	.011

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002A or B were administered prior to the start of training.

CRITERION

The criterion data consisted of one instructor's rating on each individual. The ratings place trainees into one of three broad categories: Excellent, good or poor.

Rating Scale: Broad category.

Reliability: Since only one rating was obtained, no measure of criterion reliability is available.

Criterion distribution: Ratings of excellent, good and poor were converted to numerical scores of 61, 50 and 39, respectively when corrected for broad categories

Criterion dichotomy: The criterion distribution was dichotomized into low and high groups by placing 31% of the sample in the low criterion group to correspond with the percentage of trainees placed in the poor trainee group. Trainees in the high criterion group were designated as "good trainees" and those in the low group as "poor trainees."

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitude S which does not have a high correlation with the criterion was considered for inclusion in the norms because the qualitative analysis indicated that it was important

for the job duties and the sample had a relatively high mean score on this aptitude. Tables 3, 4, and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis.
(Based on the job analysis, the aptitudes indicated appear to be important to the work performed)

Aptitude	Rationale
G - Intelligence	Necessary in understanding instructions and in learning basic theories of electrical measurements and circuits, machine maintenance and repair, plumbing and heating systems.
S - Spatial Aptitude	Necessary to lay out, measure and cut to size various materials to repair floors, walls, pipes, roofing and spouting.
K - Motor Coordination	Necessary in the quick and accurate use of hand tools.
M - Manual Dexterity	Necessary in the use of hands for all phases of repair and maintenance of the physical structure of buildings.

TABLE 4

Means, Sigmas, and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB.

Aptitudes	Mean	Sigma	r***
G-Intelligence	88.8	15.3	.330**
V-Verbal Aptitude	91.2	14.5	.354**
N-Numerical Aptitude	85.4	17.0	.372**
S-Spatial Aptitude	91.6	16.2	.190
P-Form Perception	92.1	17.9	.354**
Q-Clerical Perception	88.7	12.8	.240*
K-Motor Coordination	84.9	21.8	.042
F-Finger Dexterity	75.4	19.5	.274*
M-Manual Dexterity	88.5	23.6	.177

*Significant at the .05 level
**Significant at the .01 level
***Corrected for broad categories

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data Important	X			X			X		X
Irrelevant									
Relatively High Mean	X	X		X		X			
Relatively Low Sigma		X				X			
Significant Correlation with Criterion	X	X	X		X	X		X	
Aptitudes to be Considered for Trial Norms	G	V	N	S	P	Q		F	

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of aptitudes G, V, N, S, P, Q and F, at trial cutting scores were able to differentiate between the 69% of the sample considered good workers and 31% of the sample considered poor workers. Trial cutting scores at five point intervals approximately one standard deviation below the mean are tried because this will eliminate about one third of the sample with three-aptitude norms. For two-aptitude trial norms, minimum cutting scores of slightly more than one standard deviation below the mean will eliminate about 1/3 of the sample; for four-aptitude trial norms, cutting scores of slightly less than one standard deviation below the mean will eliminate about 1/3 of the sample. The Phi Coefficient was used as a basis for comparing trial norms. Norms of G-70, V-70 and N-75 provided the highest degree of differentiation. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .32 (statistically significant at the .005 level).

TABLE 6

Predictive Validity of Test Norms, G-70, V-70 and N-75

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	9	50	59
Poor Workers	12	15	27
Total	21	65	86

Phi Coefficient (ϕ) = .315 Chi Square (X^2) = 8.514
Significance Level = $P/2 < .005$

DETERMINATION OF OCCUPATIONAL APTITUDE NORMS

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 OAP's included in Section II of the Guide to the Use of the General Aptitude Test Battery. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.

A-P-P-E-N-D-I-X

JOB DESCRIPTION

Job Title: Maintenance Man, Building 5-83.611

Job Summary: Keeps physical structure of factory building, school building, apartment house, church or similar structure in good repair.

Work Performed: Repairs and maintains woodwork and furniture using portable power equipment where needed. Applies and installs new types of building materials, plastics, metals and hardware.

Makes electrical repairs including the fixing of broken lines, the installing of switches, receptacles and junction boxes, the checking and replacing of fuses, the location and repair of short circuits and the care and maintenance of motors and fixtures.

Patches and repairs cement, lays concrete blocks and repairs plaster and drywall.

Makes minor plumbing and pipe repairs. Services faucets, drains and sanitary fixtures. Makes sweated and threaded joints and installations.

Measures and sketches for minor sheet metal installations. Installs prefabricated units. Repairs and replaces roofing and spouting. Solders and rivets.

Maintains heating systems. May be required to fire low and high pressure stationary boilers.